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10/767,061	01/30/2004	Chae-Whan Lim	46259	5489

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EXAMINER	
MOHR, ERIC JOHN	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/767,061	LIM ET AL.	
	Examiner	Art Unit	
	Eric J. Mohr	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 September 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Device and Method for Image Segmentation, including Classification and Binarization of Character Regions.

Drawings

2. The examiner believes several drawings are not of optimal quality, perhaps damaged during transmission, and therefore it would be in the applicant's best interest to submit replacement drawings. These drawings include figures:

a. 11A, 19A, 19C, 19D, 19E, 19F, 21A, 21B, 21C, 21D, and 21E

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 6-12, and 16-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Osamu Nakamura et al., "Extraction Of Photographic Area From Document Images", referred to as Nakamura within this document.

Consider claims 1 and 11, Nakamura discloses a method and device for binarizing an image **(see page 80, section 3 where Nakamura discusses bi-level quantization of an image)**, comprising:

an input part for receiving an image **(figure 1 shows an input document image)**;

a block classification part for dividing the received image into blocks **(see page 77, section 2.1 where Nakamura discusses segmenting the image into blocks)**, and classifying the divided blocks into character blocks and background blocks **(see page 78, section 2.2 where Nakamura discusses classifying the blocks based on attributes)**;

an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part, and generating a threshold for distinguishing character pixels and background pixels of the character block **(see page 81, section 4.2 where Nakamura uses edge elements to determine a threshold for bi-level quantization)**; and

a binarization part for binarizing pixels of character blocks output from the edge enhancement part into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of background blocks output from the block classification part into the second brightness value **(see page 80, section 3, where Nakamura discusses the use of bi-level and notchless bi-level quantization of an image to threshold the image into a binary equivalent image)**.

Consider claims 7 and 17, Nakamura discloses a method and device for binarizing an image **(see page 80, section 3 where Nakamura discusses bi-level quantization of an image)**, comprising:

an input part for receiving an image **(figure 1 shows an input document image)**;

a block classification part for dividing the received image into blocks **(see page 77, section 2.1 where Nakamura discusses segmenting the image into blocks)**, and classifying the divided blocks into character blocks and background blocks **(see page 78, section 2.2 where Nakamura discusses classifying the blocks based on attributes)**;

a block growing part for growing the classified character blocks, and restoring a block containing a character pixel, classified as a background block, to a character block **(see page 79, section 2.3 where Nakamura discusses growing expanding blocks and connection regions that may have escaped classification)**;

an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part, and generating a threshold for distinguishing character pixels and background pixels of the character block **(see page 81, section 4.2 where Nakamura uses edge elements to determine a threshold for bi-level quantization)**; and

a binarization part for binarizing pixels of character blocks output from the edge enhancement part into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of background blocks output from the block

classification part into the second brightness value **(see page 80, section 3, where Nakamura discusses the use of bi-level and notchless bi-level quantization of an image to threshold the image into a binary equivalent image)**.

Consider claims 9 and 19, Nakamura discloses a method and device for binarizing an image **(see page 80, section 3 where Nakamura discusses bi-level quantization of an image)**, comprising:

an input part for receiving an image **(figure 1 shows an input document image)**;

a block classification part for dividing the received image into blocks **(see page 77, section 2.1 where Nakamura discusses segmenting the image into blocks)**, and classifying the divided blocks into character blocks and background blocks **(see page 78, section 2.2 where Nakamura discusses classifying the blocks based on attributes)**;

a block grouping part for grouping a character block output from the block growing part with its neighboring blocks, thereby generating a grouped block **(see page 79, section 2.3(1) where Nakamura discusses integrating blocks based on it's eight-neighbors)**;

an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part, and generating a threshold for distinguishing character pixels and background pixels of the character block **(see page 81, section 4.2 where Nakamura uses edge elements to determine a threshold for bi-level quantization)**;

a block splitting part for separating the character block from the grouped block output from the edge enhancement part **(see page 79, section 2.3(3) where Nakamura discusses dividing integrated areas into sub-blocks)**; and

a binarization part for binarizing pixels of character blocks output from the edge enhancement part into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of background blocks output from the block classification part into the second brightness value **(see page 80, section 3, where Nakamura discusses the use of bi-level and notchless bi-level quantization of an image to threshold the image into a binary equivalent image)**.

Consider claims 10 and 20, Nakamura discloses a method and device for binarizing an image **(see page 80, section 3 where Nakamura discusses bi-level quantization of an image)**, comprising:

an input part for receiving an image **(figure 1 shows an input document image)**;

a block classification part for dividing the received image into blocks **(see page 77, section 2.1 where Nakamura discusses segmenting the image into blocks)**, and classifying the divided blocks into character blocks and background blocks **(see page 78, section 2.2 where Nakamura discusses classifying the blocks based on attributes)**;

a block growing part for growing the classified character blocks, and restoring a block containing a character pixel, classified as a background block, to a character block **(see**

page 79, section 2.3(2) where Nakamura discusses growing expanding blocks and connection regions that may have escaped classification);

a block grouping part for grouping a character block output from the block growing part with its neighboring blocks, thereby generating a grouped block **(see page 79, section 2.3(1) where Nakamura discusses integrating blocks based on it's eight-neighbors);**

an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part, and generating a threshold for distinguishing character pixels and background pixels of the character block **(see page 81, section 4.2 where Nakamura uses edge elements to determine a threshold for bi-level quantization);**

a block splitting part for separating the character block from the grouped block output from the edge enhancement part **(see page 79, section 2.3(3) where Nakamura discusses dividing integrated areas into sub-blocks);** and

a binarization part for binarizing pixels of character blocks output from the edge enhancement part into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of background blocks output from the block classification part into the second brightness value **(see page 80, section 3, where Nakamura discusses the use of bi-level and notchless bi-level quantization of an image to threshold the image into a binary equivalent image).**

Consider claims 2, 6, 12, and 16, Nakamura discloses the method and device of claims 1 and 11, wherein the edge enhancement part comprises:

a first threshold selection part for calculating a first threshold for classifying each pixel of the character block as a character pixel or a background pixel **(see page 76, section 1 where Nakamura discusses thresholding as a means to extract image areas)**;

a mean computation part for classifying pixels of the character block into character pixels and background pixels on the basis of the first threshold, and calculating mean brightness values for character pixels and background pixels of the character block **(see page 78, section 2.2 where Nakamura discusses using the mean level of the background as a threshold in determining block attributes)**;

a normalization part for normalizing the pixels of the character block using the mean brightness value for character pixels and the mean brightness value for background pixels output from the mean computation part so that the character pixels have a value close to `1` while the background pixels have a value close to `0` **(see equation 5 where Nakamura calculates a weight for each block, the weight indicating the normalized background value of each block)**;

a quadratic operation part for performing a quadratic operation on the normalized character block to enhance edges of the character block and reduce noise of the character block **(see page 78, section 2.2 where Nakamura uses a quadratic curve approximation after noise removal via a smoothing filter)**;

a denormalization part for denormalizing the quadratic-processed character block and providing the denormalized character block to the binarization part **(see page 78,**

section 2.2 where Nakamura keeps the normalized values separate from the normalized values, the normalized values are used for classification while the non-normalized values are used in bi-level quantization); and

a second threshold selection part for calculating a second threshold for classifying each pixel of the denormalized character block as a character pixel or a background pixel, and outputting the second threshold as a threshold for the binarization part **(see page 79, section 2.2(5) where Nakamura reclassifies blocks using a decision threshold)**.

Consider claims 8 and 18, Nakamura discloses the method and device of claims 7 and 17, wherein the block growing part comprises:

a dilation part for growing a character block and changing a block containing a character pixel, classified as a background block, to a character block **(see page 79, section 2.3(2) where Nakamura discusses expanding blocks by one width on each side)**; and a closing part for eroding the dilated character block and deducting connected blocks **(see page 79, section 2.2(5) where Nakamura discusses reclassifying blocks)**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura as applied to claims 2 and 12 above, and further in view of Shan Mo et al., "Adaptive, Quadratic Preprocessing Of Document Images For Binarization", referred to as Mo in this document.

Consider claims 3 and 13. Nakamura discloses the edge enhancement method and device of claims 2 and 12. Nakamura does not explicitly disclose that the edge enhancement portion of these claims is a quadratic filter. Mo discloses using quadratic filters to edge enhance images **(see abstract of Mo)**.

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Nakamura, and modify the edge enhancement means to use a quadratic filter, as taught by Mo, thus improving the quality of binarized images, as discussed by Mo **(see abstract)**.

5. Claims 4, 5, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura as applied to claims 1 and 11 above, and further in view of Ricardo L. De Queiroz et al., "Fast Segmentation Of The JPEG Compressed Documents", referred to as De Queiroz in this document.

Consider claims 4 and 14, Nakamura discloses the method and device of claims 1 and 11, wherein the block classification part comprises an image division part for dividing the received image into blocks having a predetermined size **(see page 77, section 2.1 where Nakamura discusses segmenting the image into blocks of 32 x**

32 pixels). Nakamura also discloses thresholding and classification of an image based up on average energy in an image **(see page 78, section 2.2 where Nakamura discusses using the mean level of the background as a threshold in determining block attributes)**. Nakamura does not explicitly disclose the use of discrete cosine transform conversion blocks and using the energy calculation of said blocks for region classification.

De Queiroz discloses an image classification method including:

a discrete cosine transform (DCT) conversion part for DCT-converting blocks output from the image division part **(see page 368, section 2.1 where De Queiroz discusses JPEG compression involving the discrete cosine transform)**;

an energy calculation part for calculating a sum of absolute values of dominant DCT coefficients within each of the DCT-converted blocks, and outputting the calculated sum as an energy value of the corresponding block **(see page 369, section 2.2 where De Queiroz discusses computing the energy of each DCT block using the absolute value of the DCT coefficients)**.

It would have been obvious to one skilled in the art at the time the invention was made to modify the invention of Nakamura, and modify the energy detection means to include DCT coefficient block energy, as taught by De Queiroz, thus allow faster segmenation and discrimination of areas in a compressed image, as discussed by De Queiroz **(see page 367, section 1.1)**.

Consider claims 5 and 15, De Queiroz discloses each of the blocks having a size of 8 x 8 pixels and a scalable summation for calculating the energy of each block **(see pages 369-370, section 2.2 where De Queiroz discusses computing the AC energy of 64 pixel blocks)**.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Zhu (US 6,195,459) discloses processing and binarizing an image by segmenting an image into block and classifying blocks as text or other image types based on block features.

b. Murata (US 5,535,013) discloses enhanced image compression via discrete cosine transform by classifying each block of an image as a specific type and compressing different block types in different ways.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric J. Mohr whose telephone number is (571) 270-5140. The examiner can normally be reached on 7:30am-5pm M-Th, 7:30am-4pm Alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nick Corsaro can be reached on (571) 272-7876. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eric J. Mohr